

# Seasonal Occurrence of Insect Pests in Pecan

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# IPM

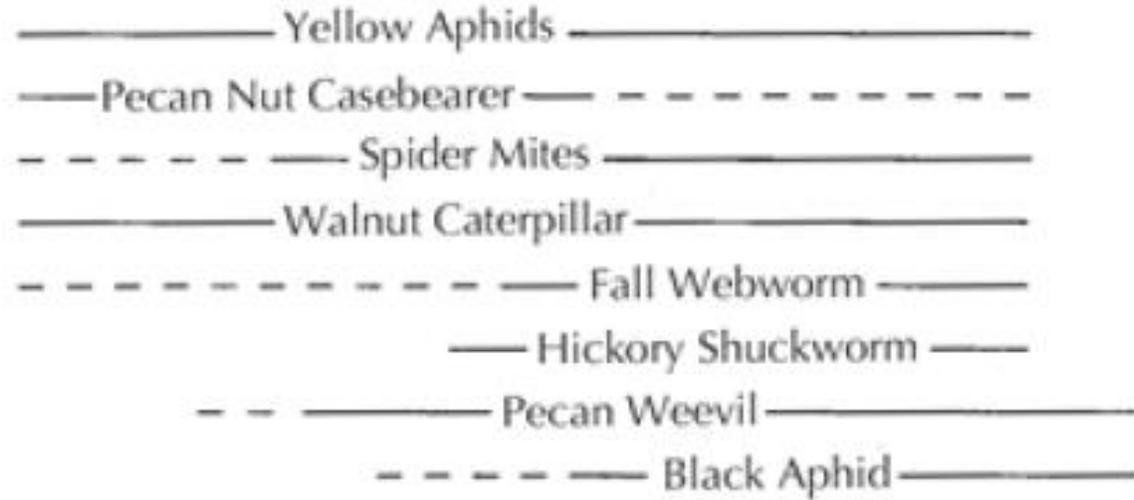
- **Integrated pest management (IPM) is a sustainable approach to manage pest that combines prevention, avoidance, pest monitoring, and suppression in a manner that minimizes health, economic, and environmental risk.**
- **Multiple Strategies!!!**
- Save money
- **Good for the Environment**
- Increase yield and profitability

# Pecan Insect Pests

April



November



— Phylloxera



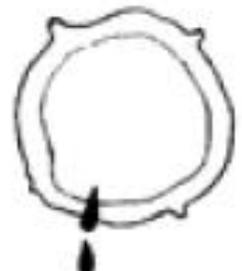
Dormant



Bud break



Pollination



Water stage



Gel stage



Half shell hardening



Dough



Shuck split

# Dormant Season

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- Inspect trees for trunk/limb problems.
- Identify problems from the previous year.
- Management!!!



# Scale Insects on Pecan

- A large group of minute and highly specialized herbivorous insects.
- Hemiptera
- Inconspicuous
- Infestations can be highly damaging
- Many species, some are found more commonly on pecan
- Obscure scale usually the most damaging



# Obscure Scale

- Can weaken trees
- Attacks pecan, hickory, oak, and others
- Draws sap from tree branches
- Entire limbs may die
- Affected trees more susceptible to borers and disease



# Obscure Scale

## Life cycle:

- One generation per year.
- Overwinter as nymphs.
- Females mature late April.
- Eggs
- Crawlers - overlapping stages – Summer, Fall, Winter\*

\*Must overwinter on living tissue;  
not found on leaves and nuts



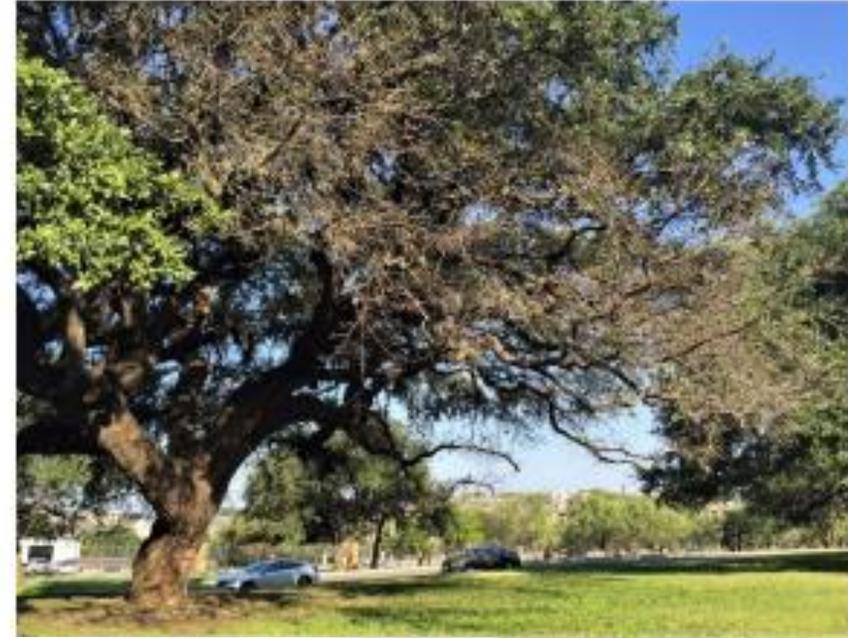
# Obscure Scale

- Often occurs in neglected trees
- Inspect limbs for female scales overwintering
- Populations can increase quickly
- Control initiated in winter with dormant oils
- Apply before budbreak
- **THOROUGH COVERAGE** is the key!!!

# Damage



- Immature scale and adult females use piercing/sucking mouthparts to feed on plant sap (adult males do not feed)
- Infestations typically start on the lower, inner portions of the tree, spreading toward terminals
- Severe infestations can weaken and kill limbs



# Scale Management

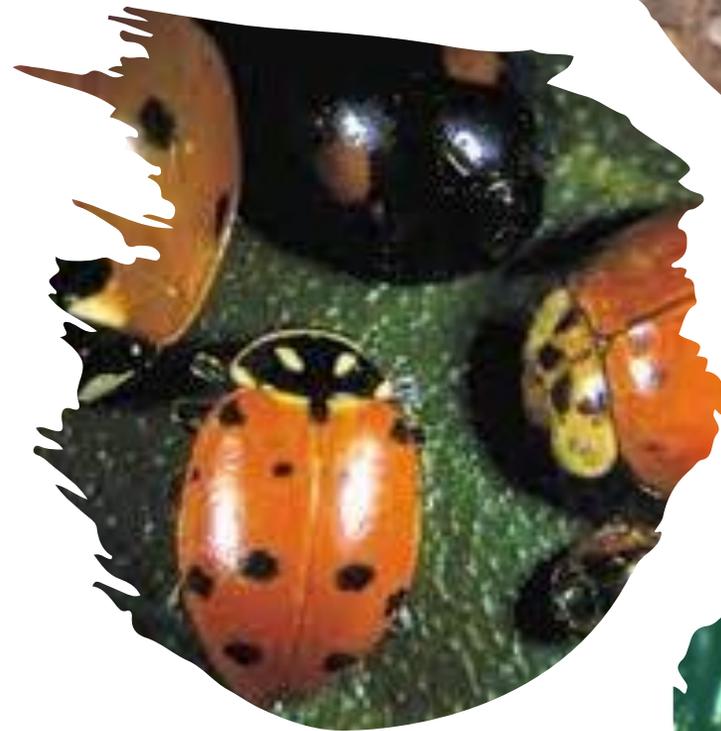
## Biological Control:

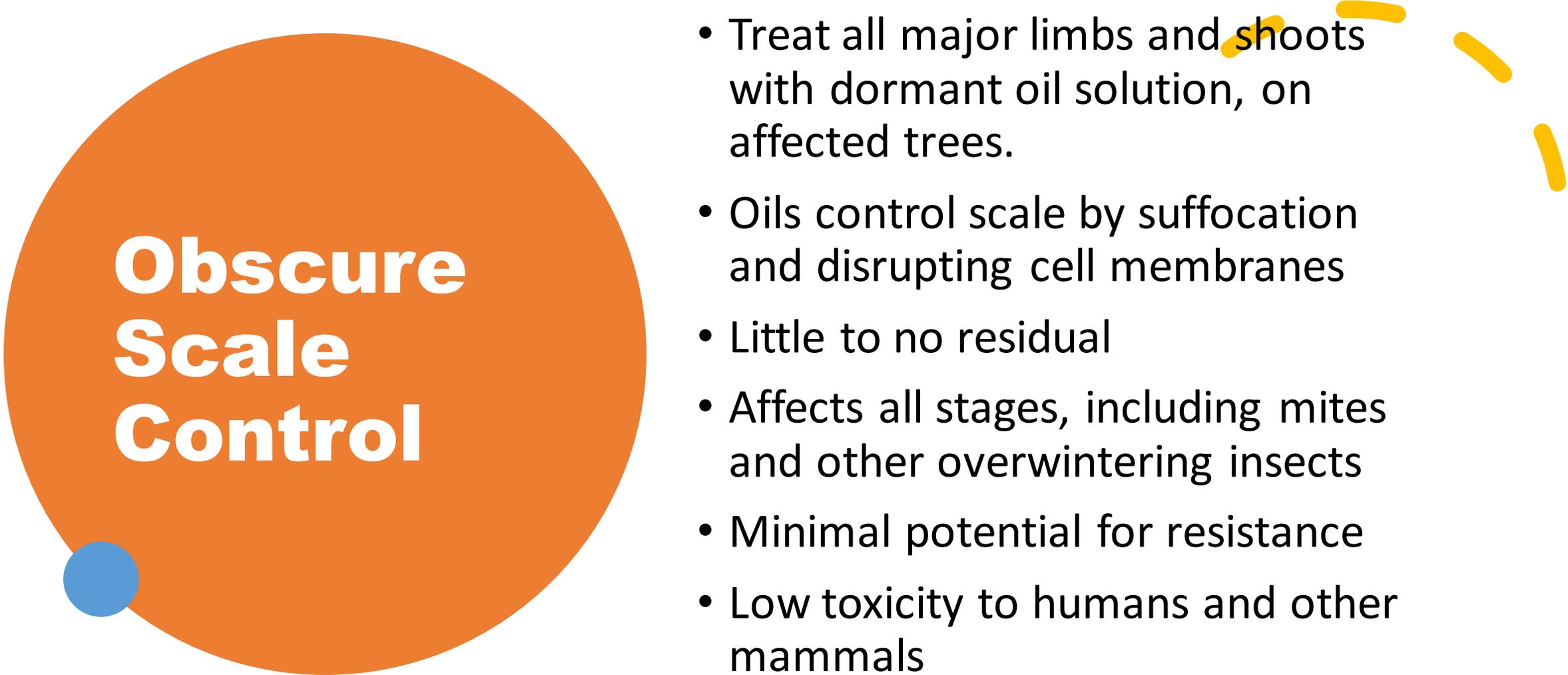
- Predators (certain species of lady beetles, predatory mites)
- Parasites (several species of parasitic wasps)
- Pathogens (pink scale fungus [*Nectria diploa*])

## Dormant Oils:



...scales indicate that a





# Obscure Scale Control

- Treat all major limbs and shoots with dormant oil solution, on affected trees.
- Oils control scale by suffocation and disrupting cell membranes
- Little to no residual
- Affects all stages, including mites and other overwintering insects
- Minimal potential for resistance
- Low toxicity to humans and other mammals
- Only problem is potential phytotoxicity!!!

# Beneficial Insects

- Key component in IPM program.
- Aid in suppressing soft-bodied insects such as aphids.
- Can aid in other insect control.
- Timing generally coincides with development of pecan insect pests in early spring.
- Unwarranted, broad-spectrum insecticide applications are not recommended early season and into summer.
- Products designed specifically for lepidopteran pest are easy on beneficials.

# Lady Beetles



# Other Beneficials





Spiders, Beetles, and  
more

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**What Type of  
Damage is This?**

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# Early Season (Phylloxera)

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# Phylloxera

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- Hemiptera
- The primary concern is with pecan stem phylloxera, *Phylloxera devastatrix*.
- This species, which attacks pecan shoots and fruit, can destroy an entire nut crop and severely weaken and disfigure limb and shoot growth.
- Other species cause less damage, but heavy infestations can cause some defoliation.
- Can serve as host for first generation shuckworm, leading to increased populations.



# Biology

- Up to three generations per year, depending on species.
- Overwinters as a single egg in the dead body of female phylloxera.
- Budbreak
- After eggs hatch, the nymphal stage, known as the stem mother, moves to the opening buds and begins feeding. (Upwelling, galls)
- Stem mother deposits eggs.
- The eggs of the stem mother hatch into winged females, referred to as winged migrants. (late May – early June)
- This stage is responsible for distribution of the insects throughout an orchard.



# Biology cont'd

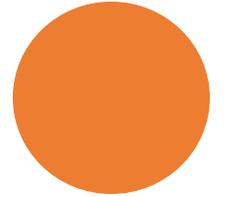
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- After mating the female eventually dies with an egg inside her body, and the cycle repeats.
- The galls or knots formed can be very unsightly but can be tolerated in the first year.
- **Timing**: Treat when stem mothers become active.
- Late March to early April, peaking around mid April.
- Dependent on tree phenology (leaf expansion).



# Early Season Control

- Producers that had phylloxera last season should consider treatment.
- Insecticides (Apply only if needed and to trees affected).
- After budbreak, but before there is more than 2 inches of new leaf growth is the ideal time to treat for this insect pest.
- Once phylloxera are imbedded in the new tissue and the galls are observed it is too late.



# Control Cont'd

- Malathion (1B), Sevin XLR (1A), Silencer (3A), Warrior II (3A), Centric (4A), Movento (23), Asana (3).
- 100 gal/acre.
- Thorough coverage is crucial.



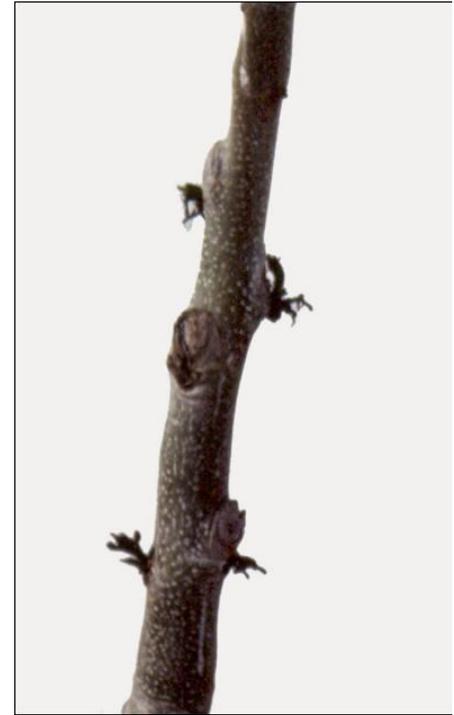
## **Pecan Bud Moth**



# Pecan Bud Moth (Bud Break)

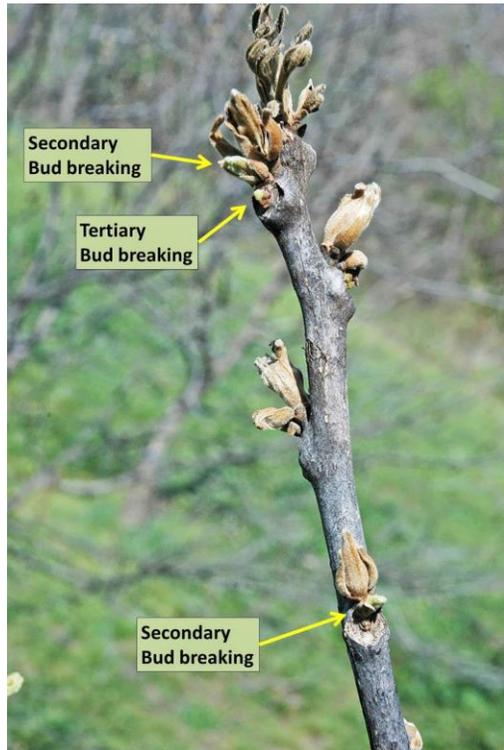
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- The pecan bud moth, *Gretchena bolliana* (Slingerland), is a native pest of pecan and hickory throughout the pecan belt.
- Bud moths may defoliate mature pecan trees, feed on young nuts in spring, and infest shucks in the fall.
- Most damage is to nursery stock and newly transplanted trees.
- Feeding by bud moth larvae destroys the buds.
- Multiple branching (crow's feet) of the terminals and growth of unwanted lateral branches.
- Can lead to death of young trees.



# Pecan Bud Moth Damage

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# Bud Moth Damage Cont'd

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# Biology

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- Insect order: Lepidopteran
- Overwinters as an adult under bark.
- Eggs laying begins in the spring on twigs, buds, and leaves.
- Pecan bud moths can complete a generation in about one month.
- 5 to 6 generations per year.



# Control

## Transplanted Trees:

- Newly transplanted trees should be monitored and treated to control the bud moth as needed.
- Insecticide applications should be applied at or before budbreak. *Repeat application may be needed.* (Residual)
- Control of the pecan bud moth on **mature trees** is usually accomplished through sprays applied for other pecan pests.



# Other Damage Around Budbreak

## Sawfly:

- Occurs around the same time as budmoth.
- Some sawfly species, after feeding, leaves behind shot-holes. Other species devour the entire leaf.



# Description

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- Adults are small, bee-like insects about 1/5 inch (5 mm) long.
- Sawfly larvae generally feed on the underside of the foliage, chewing round, regular holes in the leaflet.
- Feeding holes are very small at first but increase in size as larvae develop.
- Adults emerge from the ground around budbreak.
- Control is seldom necessary. Sprays applied for control of other pecan pests normally suppress sawfly outbreaks.

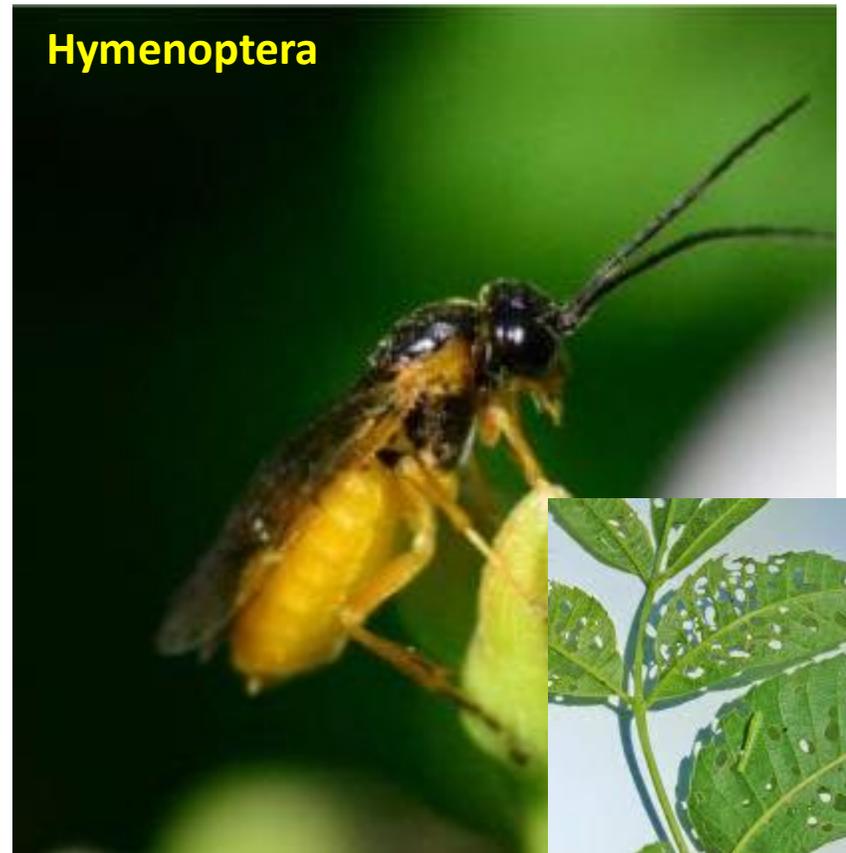
# Pecan Sawfly Damage



# Life Cycle

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- There is one generation of this pest per year in Oklahoma.
- Wasps emerge in early spring to deposit their eggs on new foliage. Larvae feed on the leaves in April and May.
- The larvae are often gregarious and feed in groups, but do not spin webs in which to feed.
- This generally occurs in Oklahoma prior to catkin formation.
- Mature larvae leave the trees and pupate in the soil to overwinter.





# Pecan Nut Casebearer (PNC)

Early - mid Season

# PNC



# PNC

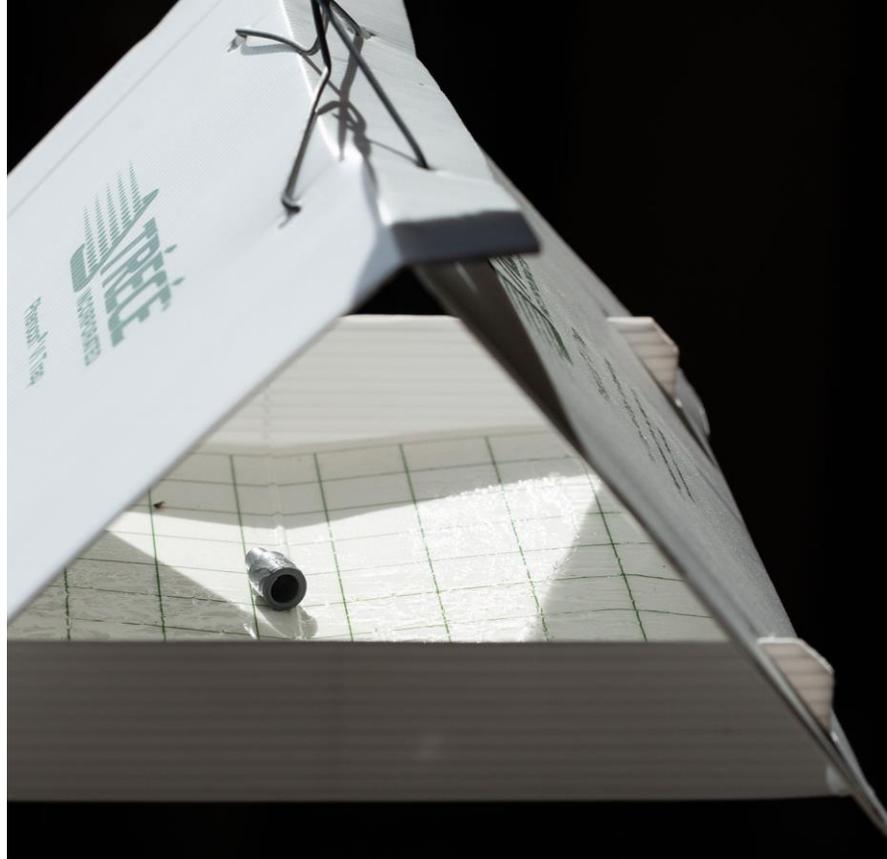
- Overwinter in tree near old buds.
- Up to three generations.
- 42-45 days.
- Occurrence can vary.
- Can experience 75 % or more crop loss.
- Monitoring:
  - adult males





# PNC Trap and Pheromone

- Traps out early
- Scout as often as possible



# Scouting

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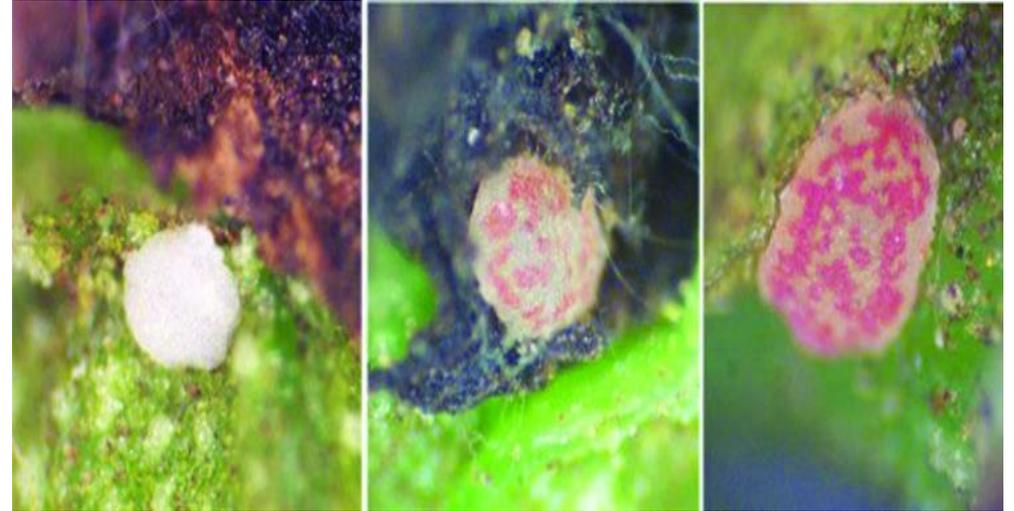
- Traps out around the first of May.
- Ideally looking for several zero capture days.
- Identify Biofix
- Historically toward the end of May in Northern Oklahoma.

Eggs???

-10 clusters/tree/310



**PNC  
Egg**



# Early Damage



- 2 eggs/310 clusters
- Look for frass and webbing around base.
- First generation PNC can destroy whole nut clusters, next generation (1-2).
- 12-16 days to damage
- Up to 3 generations (42-45 days apart).

# Timeline

Order traps w/pheromone

Traps out May 1-10

Monitor regularly

Identify biofix

Begin scouting 12-16 days later

Eggs and/or damage

Treatment not always warranted, scout carefully

Second generation in about 45 days (mid-July).

# Control

## Insecticides:

- -Apply something easy on beneficials
- -Intrepid (18) or Confirm (18)

## Organic:

- - Entrust (5), Javelin or Dipel (B.t.) (11A). Grandevo-\$\$\$

# Common Leaf Feeders (mid-late season)

- Fall Webworm
- Walnut Datana
  - Lepidopteran
  - Management



**Control**

Apply  
something easy  
on beneficiaries.

Intrepid (18) or  
Confirm (18)

# Mid to Late Season (Aphids)

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- Three species
- Generally controlled by beneficials early season into summer.



# Aphids

- Overwinter in egg stage, hatch in March.
- Multiple generations per year.
- Black-margined aphid, wings flat over body.
- Yellow pecan aphid, wings roof-like over body.
- Black pecan aphid, wings roof-like over body and dark green to black in color.



# Damage from Pecan Aphids

- Honeydew secretions.
- Early defoliation can affect current crop and return bloom for next season.
- Thresholds for aphids:
  - Yellow aphid complex; 20-25 aphids/compound leaf.
  - Black aphids; 2/compound leaf





# Management Options

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- Rely on beneficials (lady beetles, lacewings, etc.) and weather (cool and wet) to help with control.
- During weevil season incorporate an aphicide: (Several options), with initial weevil spray to control weevil and suppress aphids.
- Soil applied???

# Hickory Shuckworm (HSW)

- The adult is a small, dark brown to smoky black moth about 1/3 inch long. There is a series of dark and white marks on the outer edge of each front wing near the outer end.
- The larvae are white or cream colored with brown heads and are about 1.5 inch long at maturity.



# HSW

- Shuckworms overwinter as pupae in old pecan shucks on the tree or scattered about on the orchard floor.
- Adults emerge from mid-April to mid-May, mate, and lay eggs.
- First generation eggs may be laid on hickory nuts, small pecan nutlets, or phylloxera galls.



# HSW

- First generation larvae may destroy a few pecan nutlets, but this damage is usually not heavy enough to be serious.
- Second generation larvae feed in the nuts causing them to drop from the trees. (July)
- Third generation larvae mine the shucks, reducing nut fill and causing the shucks to adhere to the shell. This reduces nut quality and yield.
- Damage to phylloxera galls can be considered \_ beneficial; however, serious shuckworm problems often follow a heavy infestation of phylloxera.



# HSW Management

- Application July 1 – July 7.
  - A Repeat application (2weeks later) may be needed.
  - Intrepid (18) or Confirm (18) are good options.
  - Organic options- Entrust (5), Grandevo.
  - Others, not as easy on beneficials
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- Can be a problem into pecan weevil time.

# Pecan Weevil

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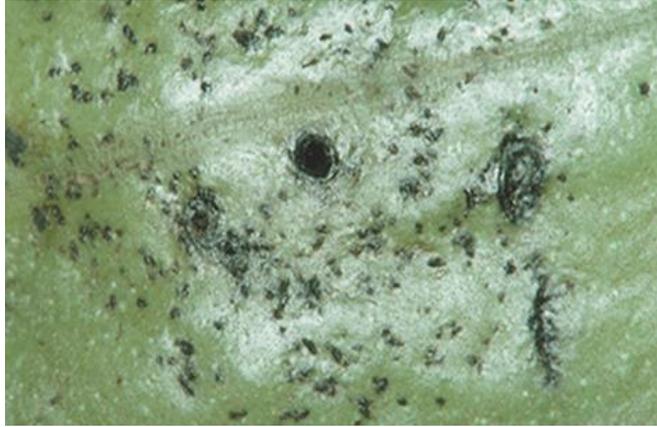
- Major pest of Pecan.
- Approximately 85% of weevil orient to the trunk after emergence. Most will crawl, but 10-15% will fly into canopy.
- Pecans are susceptible from the dough stage to shuck split.



# PW Life Cycle

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- Weevils emerge from soil after heavy rain (generally in August, peaks in September, but can extend into mid-Oct).
- Nut feeding in early (water) stage causes nut to abort and fall.
- Late gel stage suitable for egg laying. Dough stage (ideal) conditions.
- Female oviposition takes place in 15-30 nuts (2-4 eggs/nut).
- Larvae feed for about 30 days destroying kernel.
- Chew exit hole, fall to the ground. Burrow into soil 4-12 inches.



Oviposition

## Multiple eggs/Nut



Feed for about 30 days before destroying kernel

# Damage

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- Larvae exit the nut after feeding, fall to the ground and burrow into the soil.
- At this point, too late to salvage kernel or prevent larval emergence.



# Will spend 2-3 years in the soil

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- Larvae will create an almost impenetrable earthen cell, pupate after one year (90%). In the second year, the remaining (10%) will turn into adults (2-3 weeks) and emerge the following year.
- From the time they enter the soil to emergence as adults takes 2-3 years.



# Control Considerations

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- Treatment considerations should be made on cost/acre?
- **Example:** Sevin XLR is about \$67.60/gallon and will cost \$33.80-\$84.50 per acre, depending on rate. Lambda-cyhalothrin 1EC cost about \$61.99/gallon and will cost \$1.21-\$2.48 per acre.
- **Weevil timing is variable depending on moisture. Therefore, it is best to trap on indicator trees (monitor early varieties in sandier soils).**
- Depending on management history, may take up to 4 applications.



# Control Cont'd

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## Pyrethroid application and aphid flare-up

- If applying pyrethroids early (August-Early September) consider mixing with an aphicide.
- Objective—to keep the leaves on the tree as late as possible.

## Organic Growers

- Grandevo WDG
- (\$50.00 or more dollars/acre). Multiple applications (2-4) may be needed.
- Premium???

# Stink Bug and Leaffooted Bug

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Stink bugs and leaffooted bugs are found throughout the pecan-producing regions of the United States.

- Southern Green Stink bug (GSB)
  - Light green,  $\frac{1}{4}$  to  $\frac{1}{2}$  in length, and shield-shaped
- Adult Brown Stink bug (ABS)
  - Similar in size and shape to GSB, but brownish-gray. Alternating light-dark markings.
- Leaffooted bugs
  - $\frac{1}{2}$  in length, and narrower body than stink bugs. Brown with flat leaf-like segments of the hind legs.



**Green Stink bug**



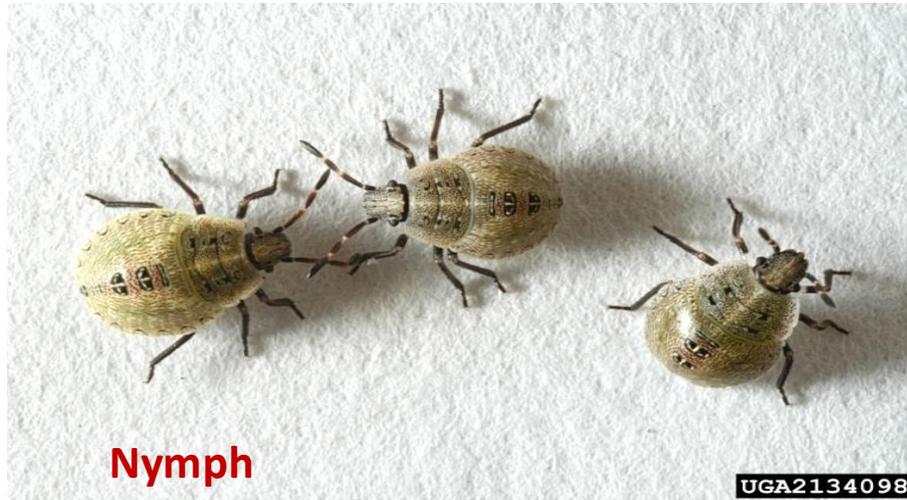
**Brown Stink bug**



**Leaffooted bug**



**Nymph**



**Nymph**





# Life Cycle and Damage

- Stink bugs and leaffooted bugs overwinter as adults in weedy areas along fence rows and ditch banks, in addition to leaf litter and bark of trees.
- Active in spring
- Five weeks from egg to adult
- Multiple generations
- Many hosts
  - Weeds
  - Cultivated crops

# Damage cont'd

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- Stink bug and Leafhopper do not reproduce or develop on pecan trees, however, feeding by adults can cause significant crop loss.

## Two types of damage:

- Black pit (premature nut drop).
- Kernel spot.



**\*\*\*Can occur after shell hardening. Monitor until crop is harvested!!!**



# Control

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- Eliminate weed host.
- Cultivated crops adjacent to orchard should be monitored and controlled, if possible, within these crops.
- Insecticide application for other late season pests can help in reducing infestation levels.
- Watch PHI???

# Thanks!!!

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